REMARKS:

Applicant appreciates the time and care the examiner has taken in examining the application.

Interview Summary under 37 CFR §1.33(b). Applicant's attorney is grateful for the time and extra consideration the examiner provided in granting and conducting a telephone interview on Wednesday, August 11, 2010. As the interview record under 37 CFR §1.33(b), Applicant states as follows.

A telephone interview was conducted on August 11, 2010, between the examiner and Jane S. Berman, Reg. No. 43,494, one of the attorneys for Applicant. The interview included discussion of internal inconsistencies in the Office action, in that the prior Section 112, second paragraph rejection concerning the term "sufficiently high momentum" was withdrawn, according to page 5, line 13 through page 6, line 2 of the final Office action, but this rejection also was repeated as to an overlapping but different list of claims at page 2, lines 2-16, of the Office action. Also, the prior rejection of claims 1-4, 9, 27-30, 44, 45, 47, 57, 58, 60 and 61 as anticipated by Quittkat, U.S. Pat. No. 4,248,639 under Section 102(b), was withdrawn, according to page 7, lines 16-21, of the Office action, but then this rejection also was repeated as to an overlapping but different list of claims at page 4, line 16 through page 5, line 11 of the Office action. In the interview, the examiner explained that the Section 112, second paragraph rejection and the Section 102(b) rejection over Quittkat had in fact been withdrawn. The examiner explained that the appearance of these two rejections in the final Office action was the result of a typographical error. Agreement was reached, insofar as the examiner confirmed to the applicant's attorney that the Section 112, second paragraph rejection and the Section 102(b)

rejection over Quittkat had in fact been withdrawn, and that accordingly no reply to these withdrawn rejections is required in response to the pending Office action.

The interview also included discussion of the pending rejection of claims 1-4, 9-16, 21, 22, 27-38, 42-45, 47 and 51-61 under Section 102(e) as anticipated by Hansen et al, U.S. Pat. No. 6,672,865. The examiner confirmed to the applicant's attorney that this was the only remaining pending rejection. The examiner explained that the rejected claims lack sufficient structural limitations to properly distinguish the claims over the prior art and that the functional limitations in the claims are insufficient to distinguish over the prior art. Applicant's attorney proposed an amendment and presented arguments that the claims as amended would not be anticipated by Hansen. Agreement was not reached but the examiner indicated he would consider an amendment filed in reply to the pending Office action.

On the Amendments. After entry of the amendments presented above, the pending claims are: 1-2, 4, 9-14, 16, 21-37, 42-45, and 51-61.

In the amendment above, the swirl vanes limitation has been added to each of the four independent claims, namely claims 1, 23, 37, and 44. Accordingly, Claims 3, 15, 38, and 47 have now been cancelled, in view of the addition of their swirl vanes limitation to each of the independent claims. The amendment to add the swirl vanes feature to the independent claims is supported in the original specification and drawings as follows (citations to paragraph numbers are to the original paragraph numbers shown in the original specification):

-- **swirl vanes** (Para. [0101] and FIGS. 4-5);

-- **positioned within the injector** (Para. [0101] and FIGS. 4-5);

-- **to provide axial swirl along an axis of the injector** (Para. [0110]; original claim 3 in International Phase; and FIGS. 4-5).

In the amendment above, throughout the claims, the term "injected gas" has been corrected to "injection gas" so that all the claims are consistent in their use of this term. "Injection gas" is supported in the original specification at Para. [0048].

No new matter is added.

On the Rejections. All contents of all prior responses to Office actions are herein incorporated by reference in their entirety.

A. -- *Section 112, second paragraph*. The examiner confirmed in the August 11, 2010 telephone interview that this rejection has been withdrawn.

B. -- *Section 102(e) over Hansen*. Applicant respectfully traverses the rejection of claims 1-4, 9-16, 21, 22, 27-38, 42-45, 47 and 51-61 under Section 102(e) as anticipated by Hansen et al., U.S. Patent No. 6,672,865.

As amended, the four independent claims in this application provide, in pertinent part:

Claim 1: "*... wherein said injector (84,86) comprises swirl vanes positioned within said injector to provide axial swirl along an axis of said injector to said injection gas as it enters the housing of the kiln system...*"

Claim 23: "*... said injector (84,86) comprises swirl vanes positioned within said injector to provide axial swirl along an axis of said injector to said injection gas as it enters the housing of the kiln system;...*"

Claim 37: "*... further comprising imparting swirl to said injection gas as it enters a housing of the kiln system (20) by use of swirl vanes positioned within said at least one injector.*"

Claim 44: "*... imparting swirl to said injection gas as it enters the housing by use of swirl vanes positioned within said at least one injector.*"

These claims define that the injection gas, itself, is caused to swirl about the axis of its injector as it enters the housing of the kiln system. According to this wording, the axial swirl is provided to the injection gas as it enters the housing, and not to the process gas flow itself.

The structure of the swirl vanes (100) and the specific advantages of the swirl vanes and the axial swirl of the injection gas as it enters the housing are described in the original specification (Paras. [0109]-[0111] (emphasis added):

[0109] As described above, the SAS 82 is provided to inject a high momentum, swirling turbulent stream of air (or other gases) into the stratified gas and particle process gas flow at an area having a temperature of approximately 850-1400 degree C in a kiln 42, gas riser 34, precalciner 58, or the like, in order to mix the process gas flow, remove the stratification and improve combustion and gas-to-particle heat transfer, making better use of available oxygen. The additional air--usually with a momentum level similar to that of the main process gas flow--arrives via injector(s) 84 or 86, designed specifically for the plant concerned.

[0110] In a preferred embodiment, the injectors 84 and 86 may also be configured to induce swirl or turbulence in the injected gases and thereby enhance entrainment of the process gas flow. FIGS. 4 and 5 show alternative arrangements of the peripheral SAS 94, in which swirl vanes 100 are included within the injectors 84 and 86. The injectors 84 and 86 may also be provided with a bluff body (not shown) or flare diffuser (not shown). A bluff body is a centrally located solid disc or cone near the exit of the injector 84 or 86 of slightly smaller maximum diameter than the injector 84 or 86. The bluff body or flare diffuser additionally enhances jet entrainment.

[0111] There are several advantages that may be observed when using a SAS 82 with a typical process gas flow. By way of example, the Reynolds number, which indicates turbulent flow and mixing, is expected to be approximately 2.5 times higher at some $7.5*10^5$ than in a typical main process gas flow, hence increasing turbulent mixing. In addition, the minimum eddy size is expected to be approximately 50 times smaller, that is, less than the size of particles of pulverized coal and raw material (around 3 microns), hence increasing heat transfer for both combustion and calcination. The turbulent frequency, which indicates the rapidity of eddy fluctuations, is also expected to be generally increased by approximately 100 times or more from perhaps $1.5*10^3$ sec^{-1} to $5*10^7$ sec^{-1}, again facilitating mixing, combustion and heat transfer. Moreover, the jet entrainment and ***mixing due to the swirl vanes 100 and/or flare diffuser or bluff body is expected to be approximately 2.5 times higher in a specific distance than for injection without such elements*** *at the same velocity, hence the amount of air and fan pressure can be lower for the same effect and give a more beneficial impact on both the installation and the process.*

It is respectfully submitted that the Hansen fails to disclose the swirl vanes or the axial swirling feature set forth in the four independent claim clauses recited above. The examiner's Section 102(e) rejection is thus in error and should be reconsidered and withdrawn. It is respectfully argued that examiner's comments reveal an error in the rejection, which resides in the failure to distinguish between the overall rotational movement of the process gas flow about the longitudinal axis of the kiln (as in Hansen), and the axial swirl that is imparted by the swirl vanes (100) to the jets of injection air (as in the four independent claims herein). Simply put, Hansen discloses no axial swirl in the injected gas, and discloses no means capable of imparting an axial swirl. Hansen itself states that FIGS. 8a and 8b merely illustrate "alternate nozzle orifice configurations," having "rectangular cross section," in nozzles 36 (Hansen, col. 9 lines

10-11). These are merely orifices 38 of a rectangular cross-section; they do nothing to impart axial swirl of the injected gas as it enters the housing of the kiln system. These orifices 38 are not swirl vanes as asserted by the examiner. There is no reference in the written description of Hansen to any axial swirling of injection gas as it enters the housing of the kiln. The flattened nozzle fronts of FIG. 8a and 8b of Hansen are not capable of causing axial swirl of the injection gas along the axis of the injector. Moreover, the orifices 38 of Hansen clearly are mere nozzle fronts; they are not positioned within the injectors, as are the swirl vanes of the independent claims herein.

As for the drawings as cited by the examiner, the flow arrows shown in FIG. 6 of Hansen coming out of the orifices 38 of nozzles 36 simply show the direction of the air coming out of the orifices 38. The flow arrows of FIG. 6 are, notably, free of any axial swirling shape; they are not of a spiral shape, which might indicate axial swirl of the injected gas. Rather, these flow arrows in FIG. 6 simply show the nozzles 36 directing high energy injected air into the rotary vessel to impart rotational momentum to the kiln gas stream. The orifices 38 direct the gas in a particular direction but nothing in the drawings, claims or written description of Hansen says or even suggests that the injected gas comes in with an axial swirl along the axis of the injector. Most importantly, these flow arrows in Hansen show the direction of the air in the overall process gas flow **after the injected gas has left the nozzles 36, and do not show axial swirl imparted to gas travelling through the injectors as it enters the housing.**

The same is true of FIG. 7 of Hansen -- it reveals no swirl vanes and no axial swirl of the injected gas as it enters the housing. The pertinent discussion in Hansen follows (Hansen, col. 9, lines 24-35 (emphasis added)):

> *With reference to FIGS. 5 and 6, two or more air injection tubes 32 can be circumferentially (or axially) on the cylindrical wall 14 of rotary vessel 12. Pressurized air is delivered to the injection tubes by fan or blower 34 in air flow*

communication through manifold 46. Alternatively, as depicted in FIG. 7, each injection tube can be connected directly to a blower or fan 34 for delivery of high energy/velocity air into the kiln gas stream. The air injection tubes 34 terminate in the kiln at a point between the top of mineral bed 22 and the axis of rotation of rotary vessel 12 in the form of a nozzle for directing high energy injected air 50 into the rotary vessel to impart ***rotational momentum to the kiln gas stream***.

The Hansen FIG. 7 flow arrows 50 simply show the direction of the air coming out of the nozzles 36. The flow arrows 50 of FIG. 7 are, notably, free of any axial swirling shape; they are not of a spiral shape, which might indicate axial swirl of the injected gas. Rather, the flow arrows 50 simply show the direction of the high energy injected air 50 injected by the nozzles 36 into the rotary vessel to impart rotational momentum to the kiln gas stream, as explicitly stated in Hansen (see quoted portion above). The other, unnumbered flow arrows of FIG. 7 are randomly placed throughout the kiln gas stream, and seem to show no axes of swirl common with the axes of the nozzles, and so obviously cannot denote axial swirl of the injection gas along the axis of the injector as it enters the housing. Most importantly, these flow arrows show the direction of air movement in the kiln gas stream ***after the injected gas has left the nozzles 36, not as it enters the housing***. These random unnumbered flow arrows in FIG. 7 are not explained in the text of Hansen, per se, but appear to reflect the flow described repeatedly in Hansen's text and claims as the improvement in turbulent flow and rotational momentum in the combustion gases flowing through the rotary vessel. (See, e.g., Hansen col. 2 line 66 through col. 3 line 10).

It is therefore respectfully submitted that Hansen fails to teach the features of the independent claims as amended above. It is submitted that no prima facie case of anticipation has been established and the rejection should be reconsidered and withdrawn.

C. -- *Section 102(b) over Quittkat*. The examiner confirmed in the August 11, 2010 telephone interview that this rejection has been withdrawn.

It is thus respectfully submitted that this application is in condition for prompt allowance; and that all of the objections, rejections and requirements raised in the Office action have been met. Early, favorable treatment of this application is requested.

The examiner is encouraged to telephone the undersigned with any questions or comments so that efforts may be made to resolve any remaining issues.

Extension Request and Deposit Account Charge Authorization. The Commissioner is hereby authorized to charge any required fees, or credit any overpayment, associated with this communication, including fees for any necessary extension of time under 37 CFR §1.136(a) for filing this communication, which extension is hereby requested, to our Deposit Account No. 50-0305 of Chapman and Cutler LLP.

Respectfully submitted,

By: _____
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